**COMPUTER COMMUNICATION NETWORKS**

**PROJECT 1 REPORT**

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**INTRODUCTION:**

The application consists of a server, client and cache. The application is capable of supporting the data transfer using TCP protocol or the stop and wait mechanism over UDP. The below information consists of a fine analysis of the pcap files generated over examining the data traffic using Wireshark. Each invocation (either TCP/ SNW-UDP) for four files file1.txt, file2.txt, file3.txt, file4.txt of sizes 16KB, 32KB, 48KB, 68KB respectively have been examined and an overall delay and throughputs have been computed and depicted in the below tables.

**METHODOLOGY:**The overall delays of each invocation i.e the four files provided namely file1.txt, file2.txt, file3.txt, file4.txt over TCP and SNW supported UDP have been calculated using the below formulae.  
  
In case of TCP protocol:

**Delay = Timestamp of Nth data packet arrived at cache – Timestamp of first get request at cache**

In case of SNW-UDP protocol:

**Delay = Timestamp of Nth data packet Acknowledgement – Timestamp of first data packet**

Similarly, the throughputs of the above transmissions have been calculated using the general formula, same for both the protocols.

**Throughput = File size in Bits / Computed Delay**

By substituting the file sizes and the delays computed for each invocation appropriately, we obtain the throughput table.

**RESULTS:**

**TABLE DISPLAYING THE COMPUTED TOTAL DELAY FOR EACH INVOCATION:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Delay** | **File 1 (16KB)** | **File 2 (32KB)** | **File 3 (48KB)** | **File 4 (62KB)** |
| **TCP (sec)** | **0.007334** | **0.0122** | **0.0144** | **0.0137** |
| **SNW (sec)** | **0.038724** | **0.074541** | **0.111636** | **0.1763** |

**TABLE DISPLAYING THE ACHIEVED THROUGHPUT FOR EACH INVOCATION:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Throughput** | **File 1 (16KB)** | **File 2 (32KB)** | **File 3 (48KB)** | **File 4 (62KB)** |
| **TCP (bps)** | **16,228,870.088** | **19,513,442.56** | **24,801,110.4** | **34,774,889.48** |
| **SNW (bps)** | **3,073,649.36** | **3,193,732.24** | **3,199,111.36** | **2,700,941.52** |

**TRENDS:**

**Data transmission over UDP of given files**

A graph of a line and a line

Description automatically generated with medium confidence

**Delays:** The delay is increasing as the file size increases.

TCP's initial increase in delay is due to the connection setup and data transmission initiation. The delay stablization later on is due to the optimized data flow.

**Throughput:** The throughput initially increases however, it decreases for the largest file transmission.

The slight increase in throughput with the file size can be due to the fixed overhead (like establishing the connection, handshakes, etc.) being amortized over a larger amount of data.

The decrease in throughput for the largest file size could be due to various factors such as increased likelihood of packet loss, network congestion, or buffer overflows.

**Data transmission over TCP of given files**

A graph of a line and a line

Description automatically generated with medium confidence

**Delays:** The delay increases for the files initially but seems to slightly decrease for the largest file size.

The initial increase in delay could be due to the time taken to establish a connection and start transmitting data. However, the stabilization or slight decrease in delay for the largest file could be due to TCP's congestion control algorithms, which optimize the flow of data to prevent network congestion.

**Throughput:** The throughput consistently increases with file size.

The throughput consistently increases with file size. This is likely due to TCP's reliable data transmission, which minimizes retransmissions and effectively utilizes the available bandwidth.